

WHAT IS CLAIMED IS:

1 1. An automated analyzer comprising:

2 (A) a transport mechanism for transporting a reaction receptacle from one location
3 within said automated analyzer to another location, the reaction receptacle including a
4 manipulating structure, said transport mechanism comprising:

5 (1) a receptacle carrier assembly constructed and arranged to be rotatable
6 about an axis of rotation and to receive a reaction receptacle and carry the reaction
7 receptacle while said receptacle carrier assembly is rotating about said axis of rotation;

8 (2) a manipulating hook member interrelated with said receptacle carrier
9 assembly so as to be movable with respect thereto, said manipulating hook member being
10 constructed and arranged to be engageable with the manipulating structure of the reaction
11 receptacle; and

12 (3) a hook member drive assembly including a hook motor having fixed
13 structure carried by said receptacle carrier assembly in a fixed position with respect
14 thereto and a lead screw mechanism including a threaded shaft oriented in a generally
15 radial direction with respect to said axis of rotation and having an end coupled to said
16 manipulating hook member, said lead screw mechanism being operatively coupled with
17 said hook motor and being constructed and arranged to convert powered motion of said
18 hook motor into movement of said threaded shaft with respect to said fixed structure of
19 said hook motor in either axial direction of said threaded shaft to thereby cause
20 corresponding movement of said manipulating hook member with respect to said
21 receptacle carrier assembly so that a reaction receptacle engaged by said manipulating
22 hook member can be moved with respect to said receptacle carrier assembly; and

23 (B) an incubator for receiving a plurality of the reaction receptacles containing
24 reaction fluids and maintaining the reaction fluids in a temperature controlled environment, said
25 incubator comprising:

26 (1) a housing including a receptacle access opening formed therein for
27 allowing movement of a reaction receptacle into or out of said housing through said
28 receptacle access opening;

29 (2) a command-responsive closure mechanism connected to said housing in
30 proximal relation to said receptacle access opening, said command-responsive closure
31 mechanism being constructed and arranged to be movable between a closed position and

32 an open position with respect to said receptacle access opening in response to
33 corresponding closure movement commands to prevent or permit access to said housing
34 through said access opening, said housing and said command-responsive closure
35 mechanism constituting an enclosure defining an incubation chamber therein;

36 (3) a heat source in thermal communication with said incubation chamber;

37 (4) a receptacle carrier disposed within said incubation chamber and
38 including a plurality of receptacle stations, each of said receptacle stations being
39 constructed and arranged to carry a single reaction receptacle, said receptacle carrier
40 being constructed and arranged to present any of said plurality of receptacle stations in a
41 receptacle transfer position with respect to said access opening,

42 said incubator being positioned radially outside an arc swung by said receptacle carrier
43 assembly of said transport mechanism to permit said receptacle carrier assembly to rotate
44 without interference from said incubator and said incubator being oriented so that said access
45 opening is positioned adjacent the arc swung by said receptacle carrier assembly of said transport
46 mechanism to permit said transport mechanism to:

47 (a) insert a reaction receptacle carried thereby through said access opening and into
48 an empty one of said plurality of receptacle stations by rotating said receptacle carrier assembly
49 into cooperative alignment with said receptacle access opening and moving said manipulating
50 hook member in a first direction with respect to said receptacle carrier assembly when said
51 command-responsive closure mechanism is in said open position to move the reaction receptacle
52 from said receptacle carrier assembly, through said receptacle access opening, and into supported
53 engagement within the empty receptacle station; and

54 (b) remove a reaction receptacle from a receptacle station of said receptacle carrier by
55 rotating said receptacle carrier assembly into cooperative alignment with said receptacle access
56 opening and moving said manipulating hook member in said first direction when said command-
57 responsive closure mechanism is in said open position to insert at least a portion of said
58 manipulating hook member through said receptacle access opening to engage the manipulating
59 structure of the reaction receptacle carried in said receptacle station and subsequently moving
60 said manipulating hook member in a second direction with respect to said reaction receptacle
61 carrier assembly to draw the reaction receptacle from said receptacle station, through said
62 receptacle access opening, and into supported engagement within said receptacle carrier
63 assembly.

1 2. An automated system for isolating and amplifying a target nucleic acid sequence
2 which may be present in a fluid sample contained in a reaction receptacle, said automated system
3 comprising:

4 a transport mechanism constructed and arranged to transport the reaction receptacle to
5 each of a plurality of stations of said system;

6 a separation station constructed and arranged to separate the target sequence from non-
7 target nucleic acid which may be present in the fluid sample; and

8 an amplifying incubation station comprising one or more incubators, each said incubator
9 of said amplifying incubation station defining a temperature-controlled chamber constructed and
10 arranged to receive the reaction receptacle and to incubate the contents of the reaction receptacle,
11 to which one or more amplification reagents have been provided, for a period of time and under
12 conditions sufficient to permit the target sequence to be amplified.

13 3. The automated system of claim 2, further comprising:

14 an immobilizing incubation station comprising one or more incubators, each said
15 incubator of said immobilizing incubation station defining a temperature-controlled chamber
16 constructed and arranged to receive the reaction receptacle and incubate the contents of the
17 reaction receptacle, to which a solid support material has been provided, for a period of time and
18 under conditions sufficient to permit the target nucleic acid sequence to be immobilized by the
19 solid support material,

20 wherein said separation station is constructed and arranged to separate the target
21 sequence from the non-target nucleic acid by a separation procedure which includes isolating the
22 solid support material within the reaction receptacle and removing the fluid sample therefrom.

23 4. The automated system of claim 3, wherein said immobilizing and amplifying
24 incubation stations are independent of one another or share at least one incubator in common.

25 5. The automated system of claim 3, wherein said immobilizing and amplifying
26 incubation stations are independent of one another.

1 6. The automated system of claim 3, further comprising a holding station for
2 holding a plurality of reaction receptacles.

1 7. The automated system of claim 2, wherein said separation station comprises
2 magnetic elements for subjecting the contents of the reaction receptacle to a magnetic field
3 during at least a portion of the separation procedure.

1 8. The automated system of claim 2, wherein said separation station includes a fluid
2 aspirator mechanism constructed and arranged to aspirate fluid sample from the reaction
3 receptacle after isolating the solid support material.

1 9. The automated system of claim 7, said separation station further comprising:
2 a fluid dispense mechanism constructed and arranged to provide a wash buffer to the
3 reaction receptacle after removing the fluid sample from the reaction receptacle; and
4 a mixing device constructed and arranged to agitate the reaction receptacle to resuspend
5 the solid support material after a wash buffer is provided by said fluid dispense mechanism.

1 10. The automated system of claim 3, wherein the incubators of said amplifying
2 incubation station are maintained at a temperature or temperatures different than the temperature
3 or temperatures maintained by the incubators of said immobilizing incubation station.

1 11. The automated system of claim 2, further comprising a hybridizing incubation
2 station comprising one or more incubators, each said incubator of said hybridizing incubation
3 station defining a temperature-controlled chamber constructed and arranged to receive the
4 reaction receptacle and incubate the contents of the reaction receptacle, to which one or more
5 probe reagents have been provided, for a period of time and under conditions sufficient to permit
6 the probe to hybridize to the target sequence or an amplicon thereof.

1 12. The automated system of claim 11, wherein said amplifying and hybridizing
2 incubation stations are independent of one another or share at least one incubator in common.

1 13. The automated system of claim 11, wherein said amplifying and hybridizing
2 incubation stations are independent of one another.

1 14. The automated system of claim 11, further comprising a detection station
2 constructed and arranged to detect the presence or absence of the probe hybridized to the target
3 sequence, or an amplicon thereof, as an indication of the presence or absence of an organism or
4 one or more members of a group of organisms in the fluid sample.

1 15. The automated system of claim 14, wherein said detection station comprises a
2 luminometer constructed and arranged to detect the amount of light emitted by the contents of
3 the reaction receptacle.

1 16. The automated system of claim 2, further comprising a temperature ramping
2 station constructed and arranged to raise or lower the temperature of the contents of the reaction
3 receptacle prior to transporting the reaction receptacle to said amplifying incubation station.

1 17. The automated system of claim 2, further comprising a fluid dispensing station
2 constructed and arranged to dispense a fluid sample into the reaction receptacle.

1 18. The automated system of claim 2, further comprising a deactivation station
2 constructed and arranged to deactivate the nucleic acid contents of the reaction receptacle after
3 permitting the target sequence to be amplified.

1 19. The automated system of claim 14, further comprising a deactivation station
2 constructed and arranged to deactivate the nucleic acid contents of the reaction receptacle after
3 permitting the target sequence to be amplified.

1 20. The automated system of claim 3, further comprising a hybridizing incubation
2 station comprising one or more incubators, each said incubator of said hybridizing incubation
3 station defining a temperature-controlled chamber constructed and arranged to receive the
4 reaction receptacle and incubate the contents of the reaction receptacle, to which one or more

probe reagents have been provided, for a period of time and under conditions sufficient to permit the probe to hybridize to the target sequence or an amplicon thereof.

21. The automated system of claim 20, further comprising a detection station constructed and arranged to detect the presence or absence of the probe hybridized to the target sequence, or an amplicon thereof, as an indication of the presence or absence of an organism or one or more members of a group of organisms in the fluid sample.

22. The automated system of claim 21, further comprising a deactivation station constructed and arranged to deactivate the nucleic acid contents of the reaction receptacle after permitting the target sequence to be amplified.